EGU23-6938, updated on 27 Apr 2024
https://doi.org/10.5194/egusphere-egu23-6938
EGU General Assembly 2023

High spatio-temporal rainfall algorithm over Galápagos archipelago using multispectral GOES-16 infrared brightness temperatures: the GRR product

Nazli Turini[1], Byron Delgado Maldonado[2], and Jörg Bendix[1]
[1]Philips University Marburg, Laboratory of Climatology and Remote Sensing, Geography, Marburg, Germany (turini@staff.uni-marburg.de)
[2]Charles Darwin Foundation (CDF), Av. Charles Darwin s/n, Puerto Ayora, Galápagos, Ecuador

Due to its geographic location and unique climatic circumstances, the Galápagos archipelago is renowned for its exceptional and high endemic biodiversity. Nevertheless, due to limited access to the permanent freshwater body in the archipelago, the freshwater budget is almost exclusively dependent on precipitation. However, with the lack of spatial and temporal distribution of rainfall information, it is not easy to understand the short- and long-term dynamics of rainfall in the Galápagos.

The poster presents the new satellite-based rainfall retrieval algorithm, the Galápagos Rainfall Retrieval (GRR), which offers the potential for a high spatio-temporal resolution (2 km, 10 min) rainfall product in near real-time for the Galápagos archipelago.

The algorithm is proposed to combine physical methods with machine learning in which sequences of Geostationary Earth Orbit infrared (GEO-IR) images are used to retrieve both cold season Garua drizzle and warm season convective rainfall.

In the first step, a threshold technique and spectral differences are used to identify the cloudy regions and distinguish the low, middle, and high clouds. Next, the cloud-covered region will go under a different entity-based classification method (e.g., slope test/ML algorithm) for each cloud type to detect the low stratus/Garua drizzle and potentially convective core regions. The next test follows for all detected potentially convective core regions based on cloud formation over time and space to examine whether they are likely to be decaying. If the convective core is classified as decaying, it is labelled stratiform rain; otherwise, it is labelled as the active convective core.

Finally, the rainfall assignment will be performed by training the random forest regression models. The convective and stratiform cells will be trained based on microwave-only IMERG-V06 rainfall data separately, meanwhile the cloudsat would be used to train the rainfall rate for the Garua detected regions. By the end, all of these steps are combined together as GRR product. The algorithm of GRR product will be developed for the time period 1/1/2022-1/1/2023 and then it would be applied to the entire available GOES-16 dataset.

The validation will be conduct by: i) independent microwave-only IMERG-V06 rainfall data/cloudsat not used for model training ii) recently installed automated weather stations (AWS) network with high temporal resolution of 10 minutes covering a W-E and luff-lee transects over three islands (Isabela, S. Cruz, S. Cristóbal).